




MEMORANDUM

TO: LL & S Landfill Site File

cc: Martha Bosworth, Site Assessment Manager (SAM), U.S. Environmental Protection Agency (EPA) Region I, Office of Site Remediation and Restoration (OSRR)


FROM: George Mavris, Site Leader, Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team IV (START)

THRU: John F. Kelly, Project Leader, WESTON®/START

DATE: 26 July 2016

RE: Groundwater Sampling Activities at LL & S Landfill Site, Salem, Rockingham County, New Hampshire, Technical Direction Document (TDD) Number (No.) TO1-01-16-04-0010; Task No. 0117. Document Control (DC) No. A-00072

INTRODUCTION

In September 2015, a fire occurred at the LL & S Landfill Site, located in Salem, Rockingham County, New Hampshire, that necessitated the application of up to 5,000 gallons of water per minute to extinguish the fire. It was suspected that aqueous film-forming foam (AFFF) that was staged on site for use by responding fire departments (Salem Fire Department) may have been used to aid in fire suppression. Suspected perfluorinated compounds (PFCs) in the AFFF may have been released to groundwater following the extinguishing of a fire. Due to concerns of a release of PFCs to groundwater, the New Hampshire Department of Environmental Services (NHDES) requested U.S. Environmental Protection Agency (EPA) assistance in collecting groundwater samples from selected monitoring wells and supply wells on the landfill to determine if PFCs were released to the groundwater.

On 11 May 2016, EPA and Weston Solutions, Inc. (WESTON®), Superfund Technical Assessment and Response Team IV (START) personnel mobilized to the LL & S Landfill Site and collected groundwater samples from seven shallow on-site overburden monitoring wells and three deep bedrock production wells.

SITE HISTORY AND BACKGROUND

The LL & S Landfill site (the site) is located at 87 Lowell Road in Salem, New Hampshire (see Attachment A, Figure 1). The geographic coordinates, as measured from the approximate center of the landfill, are 42°45'39.37" north and 71°14'51.34" west. The LL & S Landfill is a former unlined construction and demolition (C&D) debris landfill that according to NHDES records was in operation from March 1981 until its closure and capping with a low-permeability soil material



in July 1986. The site is abutted to the north by Route 38 (Lowell Road) and operating businesses JJ&M Auto and Fleet Maintenance, Brousseau's Advanced Automotive, Gateway Resource Recycling (metal), and LL & S Wood Product recycling (wood); to the east by Hedgehog Pond and wooded areas; to the south by wooded areas and the Campbell's Scottish Highlands Golf Course; and to the west by a wooded area and commercial/residential properties.

The Gateway Resource Recycling and LL & S Wood Product facility have operated on the property adjacent to the landfill since 1994 and are owned/operated by ReEnergy Holdings LLC. ReEnergy Holdings has numerous facilities within the region that segregate the various metal, asphalt, and concrete for re-use and the wood debris for re-use or as biomass (burning) for energy production.

Numerous groundwater studies have been conducted on abutting sites that were related to methyl tertiary butyl ether (MtBE)-contaminated groundwater from multiple sources. These include annual reports required by NH DES on each of the abutting properties and from the Town of Salem Health Department.

In September 2015, a fire occurred at the facility that necessitated the application of up to 5,000 gallons of water per minute to extinguish the fire. Additionally, it was suspected that AFFF that was staged on site for use by responding fire departments (Salem Fire Department) may have been used to aid in fire suppression. Concerns were raised due to the AFFF containing perfluorooctanoic acid (PFOA) and/or perfluorooctane sulfonate (PFOS) or similar products that may have been released to groundwater from the firefighting efforts.

PURPOSE OF SAMPLING

Due to the concerns that AFFF used during firefighting efforts at the LL & S Landfill may have infiltrated into the groundwater, EPA requested that START collect groundwater samples from selected monitoring wells to determine if the groundwater at the LL & S Landfill has been impacted by PFCs.

PFCs are a class of synthetic compounds formed from carbon chains with fluorine attached. The chemical structure of PFCs gives them unique properties, such as thermal stability and the ability to repel both water and oil, that make them useful components in a wide variety of consumer and industrial products, including non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, paints, and firefighting foams such as AFFF. PFCs have been in use since the 1950s. Because they help reduce friction, they are also used in a variety of other industries, including aerospace, automotive, building and construction, and electronics. PFCs break down very slowly in the environment and are often characterized as persistent. They also build up in the bodies of exposed humans and animals and stay there for long periods of time. Unlike many other persistent chemicals, PFCs are not stored in body fat. However, PFCs are similar to other persistent chemicals due to the long half-life of the persistent chemicals in the human body. This slow elimination time makes it difficult to determine how changes in lifestyle, diet, or other exposure-related factors influence the concentrations of PFCs in the blood.



SAMPLING ACTIVITIES – 11 MAY 2016

On 11 May 2016, START personnel George Mavris, Eric Ackerman, Bill Mahany, Andrew Danikas, and Chris Dupree; and EPA Site Assessment Manager (SAM) Martha Bosworth mobilized to Salem, Rockingham County, New Hampshire to collect groundwater samples from seven shallow on-site overburden monitoring wells and three deep bedrock production wells at the LL & S Landfill (see Attachment A, Figure 2).

START met with Charlie Nelson (Environmental Compliance Manager, ReEnergy Holdings LLC). ReEnergy Holdings LLC is currently operating the facility. The facility accepts a wide variety of waste from waste handlers, contractors, roofers, landscapers, property managers, clean-out companies, and homeowners. The facility recycles virtually all solid, non-hazardous construction and demolition materials.

Prior to beginning site activities, START and EPA personnel attended a safety course provided by ReEnergy Holdings LLC. START personnel established a support zone, and calibrated air monitoring instruments, including three MultiRAE Plus units with the following sensors: carbon monoxide (CO); hydrogen sulfide (H₂S); VOC; oxygen (O₂); and Lower Explosive Limit (LEL). A radiation detection instrument, a Ludlum Model 19A Gamma Radiation Meter, was also prepared.

Ambient air background readings on the MultiRAE Plus were as follows: O₂ (20.9%); CO [0 parts per million (ppm)]; H₂S (0 ppm); LEL (0%); and photoionization detector (PID) (0 ppm VOC). The radiation meter had background levels between 10-12 microRoentgens per hour (µR/hour).

A tailgate safety and operations meeting was conducted prior to initiation of field activities, and START and EPA personnel signed the Health and Safety Plan (HASP). Site activities were conducted in accordance with the site HASP, which was prepared as a separate document, entitled *Weston Solutions, Inc., Region I START Site Health and Safety Plan (HASP) for the LL & S Landfill Site, Salem, Rockingham County, New Hampshire*, dated May 2016.

Care was taken by the sampling team to ensure that no potential PFC-containing materials were utilized during sampling. No materials containing Teflon, Gore-Tex, or other waterproofing materials were utilized while sampling. Extra care was taken to assure that clothing, storage containers, and sampling equipment did not contain potential PFC sources.

START personnel accompanied Charlie Nelson around the landfill; and the seven overburden monitoring wells (MW-2, MW-3, MW-5, MW-6, MW-7, MW-1-93, and MW-2-93) and three bedrock production wells (WRB#208.1035, WRB#208.1130, and WRB#208.1329) to be sampled were located (see Attachment A, Figure 2). The following table summarizes the well specifications for these wells.



Monitoring Well	Total Depth* (feet)	Screened Interval (feet)	Inner Well Diameter (inches)	Protective Casing	Type of Sampling Pump
MW-2	40.5	30.5 – 35.5	2	Steel	Peristaltic
MW-3	20	14.16.5	2	Steel	Peristaltic
MW-5	9	2 – 9	2	Steel	Peristaltic
MW-6	15	2 – 15	2	Steel	Peristaltic
MW-7	25	3 - 23	2	Steel	Peristaltic
MW-1-93	36.5	25.2 – 35.2	2	Steel	Peristaltic
MW-2-93	28.5	20.8 – 28.3	2	Steel	Peristaltic
WRB#208.1035	320	Open borehole	6	NA	NA
WRB#208.1130	580	Open borehole	6	NA	NA
WRB#208.1329	340	Open borehole	6	NA	NA

* Measured from top of inner polyvinyl chloride (PVC) casing.

The overburden monitoring wells were secured with padlocks. The padlocks were unlocked by C. Nelson. The well caps were removed to monitor the headspace of each well for VOCs and combustible gases using a MultiRAE Plus unit. The radiation meter was carried around the site from well to well to monitor for radiation. VOC readings were recorded on the low-flow groundwater sampling Field Data Sheets.

Sampling activities were performed in accordance with the site Sampling and Analysis Plan (SAP), which was prepared as a separate document, entitled *Sampling and Analysis Plan for the LL & S Landfill Site, Salem, Rockingham County, New Hampshire*, dated May 2016.

Prior to collecting the groundwater samples, a Field Trip Blank (FTB-01) was prepared by removing the caps from the two laboratory-provided bottles. The full bottle labeled Field Trip Blank was carefully poured into the empty bottle marked Field Trip Blank. Both bottles were then recapped, and the Field Trip Blank bottle was returned to the re-sealable bag and placed in the sample cooler in a location away from the sampling points.

Overburden Monitoring Wells

Any dedicated Teflon, polyethylene, and/or silicon tubing found in the overburden monitoring wells was removed and placed back into the wells after sampling activities were completed. If the well casing did not have a reference point (usually a V-cut or indelible mark on the well casing), START personnel made a mark on the inner or outer casing.

Prior to placing tubing into the well, the water level and total depth of the well were measured and recorded. Care was taken not to stir sediment at the bottom of the well. The water level meter was removed from the well, and high-density polyethylene (HDPE) tubing was then measured and lowered slowly (to minimize disturbance) into the well with the intake at the midpoint of the saturated zone within the screened interval to be sampled. If the screened interval was not known, the tubing intake was placed approximately 2 feet from the bottom of the well.



Since the top of the water table in the overburden wells ranged from approximately 2.5 to 8.5 feet below the top of the inner polyvinyl chloride (PVC) casing, adjustable rate peristaltic pumps (suction) were used to purge the wells and to collect groundwater samples for PFC analysis.

Following the placement of the tubing into the well and connecting the tubing into the YSI flow cell, the water level meter was lowered into the well to the top of the water column and remained in the well while purging to record drawdown of the water column.

For the seven overburden monitoring wells, the pump was set at its lowest speed setting and slowly increased until discharge occurred. The water level was checked and the pump speed adjusted until there was little or no water level drawdown. The well was purged for a few minutes until the water was clear before allowing the water to run into the YSI flow cell. During well purging, water quality parameters [temperature, specific conductance, pH, oxidation-reduction potential (ORP), and dissolved oxygen (DO)] were measured using a YSI water quality meter. Turbidity was measured by collecting a groundwater sample at a point prior to entering the YSI flow cell and measured with a turbidity meter. The wells were purged for a minimum of 45 minutes, and when all the above indicator field parameters stabilized, purging was considered complete and sampling began.

Prior to collecting the groundwater sample, the peristaltic pump was turned off and an approximate 0.5-foot length of the HDPE tubing (between the peristaltic pump head and flow-through cell) was cut to provide a clean, uncontaminated sample collection point. The pump was then turned on and allowed to flow for approximately one minute.

The pump was adjusted to a slow, constant flow [approximately 110 - 150 milliliters per minute (mL/min)]. The sample number was written on the bottle caps with indelible ink (Sharpie). The sample bottles were carefully filled nearly to the top, being careful not to overfill the bottles during sample collection. The caps were then turned securely on the bottles. The bottles were then placed in a re-sealable bag before repeating this process with the other empty bottles. Upon the completion of sampling activities, the sample bottles were placed on ice within a secured cooler for temporary storage prior to shipping.

Bedrock Production Wells

The three bedrock production wells were sampled by opening the spigot located between the well and holding tank and purging the system for approximately 15 minutes. During well purging, water quality parameters (temperature, specific conductance, pH, ORP, DO, and turbidity) were recorded using a YSI water quality meter.

Post-Sampling Activities

The water level indicator and HDPE tubing used to sample the overburden monitoring wells were removed and the dedicated tubing that had been removed from the monitoring wells was placed back into the wells, the riser caps were placed on the PVC casings of the monitoring wells, and the padlocks were placed back on the metal casings to secure the wells.



One field equipment (rinsate) blank (RB-01) was collected by running laboratory-provided PFC-free water through HDPE and silicon tubing using a peristaltic pump. Two pieces of HDPE tubing (about 1 foot each) and one piece of silicon tubing were cut for the rinsate blank. The HDPE tubing was inserted into each end of the silicon tubing, and the silicon tubing was placed in the peristaltic pump housing. One end of the HDPE tubing was then inserted into the laboratory-provided PFC-free water container and the other end into the laboratory-provided and labelled Field Rinsate Blank container. The peristaltic pump was turned on at the slowest rate possible (approximately 100 to 120 mL/min) to attain flow, and two rinsate blank containers were filled. The sample containers were placed in a re-sealable bag, placed in a sample cooler with ice, and secured until chain-of-custody activities (Scribe) and shipment preparation could be completed.

All relevant information and observations pertaining to the sample locations on 11 May 2016 were recorded, and site features were photo-documented (see Attachment C, Photo-documentation Log). Well purge water and decontamination fluids generated during decontamination of the YSI water quality meters and water level meters was poured back onto the ground surface around the wells following the collection of the groundwater samples, in accordance with EPA and NHDES approval.

Field activities were completed and all personnel departed the LL & S Landfill site.

Chain-of-custody activities (Scribe) were completed following the collection of groundwater samples from the last well, and the samples were prepared for shipment following Weston Solutions, Inc. sample shipment protocol. The bottles were placed in the shipping container (coolers), and ice and packing materials sufficient to keep samples cool and protected from damage during shipping were added. The chain-of custody documentation was placed in a re-sealable bag and placed atop the samples prior to sealing the shipping container. The sample cooler was delivered to a Federal Express (FedEx) office for next-day delivery to the analytical laboratory.

Analytical Data Summary

On 27 May 2016, START received the analytical results from Maxxam Analytics International Corporation (Maxxam), located in Mississauga, Ontario, Canada. The groundwater samples were analyzed using Modified EPA Method 537, *Determination Of Selected Perfluorinated Alkyl Acids In Drinking Water By Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)*. Although PFCs are a class of synthetic compounds numbering more than 24, only nine specific PFCs were analyzed by the laboratory for this sampling event, as shown in the table below.

Perfluorinated Compounds	CAS Number
Perfluorobutane Sulfonate (PFBS)	375-73-5
Perfluorobutanoic Acid (PFBA)	375-22-4
Perfluoroheptanoic Acid (PFHpA)	375-85-9
Perfluorohexane Sulfonate (PFHxS)	432-50-7



Perfluorohexanoic Acid (PFHxA)	307-24-4
Perfluoro-n-octanoic Acid (PFOA)	335-67-1
Perfluorononanoic Acid (PFNA)	375-95-1
Perfluorooctane Sulfonate (PFOS)	1763-23-1
Perfluoropentanoic Acid (PFPeA)	2706-90-3

Overburden Monitoring Wells

Analytical results received from Maxxam indicated that all nine PFCs analyzed were detected at concentrations above the method detection limits (MDLs) in groundwater samples collected from six of the seven overburden monitoring wells at the LL & S Landfill. The following PFCs [maximum concentration in nanograms per liter (ng/L) and sample location in parentheses] were detected in the overburden monitoring wells: perfluorobutane sulfonate (PFBS) (23 ng/L in MW-7), perfluorobutanoic acid (PFBA) (130 ng/L in MW-6), perfluoroheptanoic acid (PFHpA) (110 ng/L in MW-7), perfluorohexane sulfonate (PFHxS) (130 ng/L in MW-7), perfluorohexanoic acid (PFHxA) (93 ng/L in MW-5 and MW-6), perfluoro-n-octanoic acid (PFOA) (560 ng/L in MW-7), perfluorononanoic acid (PFNA) (17 ng/L in MW-5, MW-6, and MW-7), perfluorooctane sulfonate (PFOS) (260 ng/L in MW-7), and perfluoropentanoic acid (PFPeA) (120 ng/L in MW-5 and MW-7 (see Attachment B, Table 1).

PFOA and PFOS were detected above the Ambient Groundwater Quality Standards (AGQS) of 70 ng/L, established by NHDES per emergency rule established on 31 May 2016, in groundwater samples collected from the overburden monitoring wells at the LL & S Landfill. PFOA was detected above the AGQS in groundwater collected from four of the overburden monitoring wells (MW-3, MW-5, MW-6, and MW-7); and PFOS was detected above the AGQS in groundwater collected from three of the overburden monitoring wells (MW-5, MW-6, and MW-7) (see Attachment B, Table 1).

In addition, when combined, concentrations of PFOA and PFOS were detected above the AGQS in groundwater samples collected from two of the overburden monitoring wells (MW-1-93 and MW-2-93) (see Attachment B, Table 1).

All nine PFCs were detected above the MDLs in six of the seven overburden monitoring wells that were sampled, with the exception of MW-2. No PFCs were detected above the laboratory MDLs in the field rinsate blank (RB-01), laboratory trip blank (TB-01), or in the field trip blank (FTB-01).

Bedrock Production Wells

Analytical results indicated that all nine PFCs analyzed were detected at concentrations above the MDLs in groundwater samples collected from all three of the bedrock production wells at the LL & S Landfill. The following PFCs (maximum concentration in ng/L and sample location in parentheses) were detected in the bedrock production wells: PFBS (9.5 ng/L in WRB#208.1035), PFBA (28 ng/L in WRB#208.1035), PFHpA (19 ng/L in WRB#208.1329), PFHxS (62 ng/L in WRB#208.1130), PFHxA (24 ng/L in WRB#208.1130), PFOA (75 ng/L in



WRB#208.1035), PFNA (4.7 ng/L in WRB#208.1035 and WRB#208.1130), PFOS (73 ng/L in WRB#208.1130), and PFPeA (28 ng/L in WRB#208.1130) (see Attachment B, Table 1).

PFOA and PFOS were also detected above the NHDES AGQS of 70 ng/L in groundwater samples collected from the bedrock production wells at the LL & S Landfill. PFOA was detected above the AGQS in groundwater collected from two of the wells (WRB#208.1035 and WRB#208.1130); and PFOS was detected above the AGQS in groundwater collected from one of the bedrock production wells (WRB#208.1130) (see Attachment B, Table 1).

When combined, concentrations of PFOA and PFOS were detected above the AGQS in groundwater collected from two of the bedrock monitoring wells (WRB#208.1329 and WRB#208.1035). In WRB#208.1035, concentrations of PFOA individually (75 ng/L) were detected above the AGQS, and PFOS (59 ng/L) was detected below the AGQS; however, when combined, the two compounds exceed the AGQS (see Attachment B, Table 1).

All nine PFCs were detected above the MDLs in all three of the bedrock production wells that were sampled.

SUMMARY

Based on one round of groundwater sampling conducted on seven overburden and three bedrock production wells, all nine PFCs tested for have been detected at concentrations above MDLs in the overburden and bedrock aquifers at the LL & S Landfill site.

The highest concentrations of PFCs detected in the overburden were in monitoring wells MW-7 and MW-6), located along the southwestern perimeter of the landfill; and in MW3, located along the southeastern perimeter of the landfill (see Attachment A, Figure 2). The concentrations of total PFCs in all three of the bedrock supply wells were approximately the same. These wells are all located along the northeastern perimeter of the landfill.

Based on the limited overburden and bedrock groundwater data, it appears that the occurrence of PFCs in both aquifers may suggest that PFC contamination is present throughout the landfill area. Wastes buried at the landfill, as well as AFFF that was staged on site, may have leached into the groundwater, and may be migrating to the southeast and south of the landfill.

Attachments

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Attachment A

Figures

Figure 1	Site Location Map
Figure 2	Site Diagram and Sample Location Map

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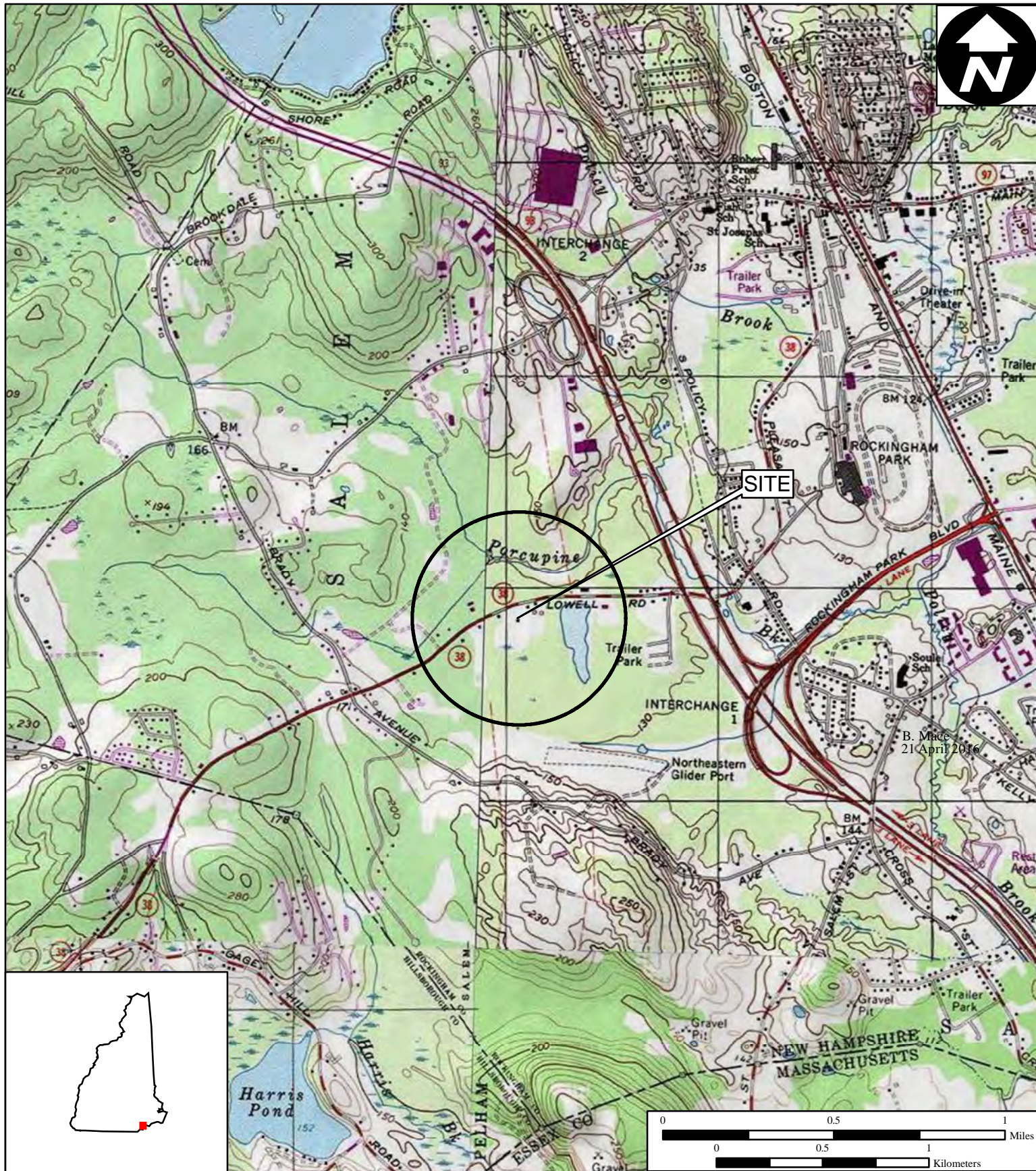


Figure 1

Site Location Map

LL&S Landfill
87 Lowell Road
Salem, NH

EPA Region I
Superfund Technical Assessment and
Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number: TO1-01-16-04-0010
Created by: B. Mahany
Created on: 06 May 2016
Modified by: B. Mace
Modified on: 19 May 2016

Data Sources:

Topos: MicroPath/USGS/USA Topo Maps
 Quadrangle Names: Salem Depot and Manchester, NH
 All other data: START






Figure 2
Site Diagram and
Sample Location Map

LL&S Landfill
87 Lowell Road
Salem, New Hampshire


EPA Region 1
Superfund Technical Assessment and
Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number: TO1-01-16-04-0010
Created by: C. Dupree
Created on: 12 May 2016
Modified by: B. Mace
Modified on: 19 May 2016

LEGEND

 Groundwater Sample Location



0 250 500
 Feet

Data Sources:

Imagery: ESRI, i-cubed, USDA FSA, USGS
AEX, GeoEye, Getmapping, Aerogrid, IGP
Topos: MicroPath
All other data: START



Attachment B

Tables and Spreadsheets

Table 1	Summary of Perfluorinated Compounds Analysis, Groundwater Samples, LL & S Landfill Site, Salem, New Hampshire, 11 May 2016
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TABLE 1

**SUMMARY OF
PERFLUORINATED COMPOUNDS
ANALYSIS IN GROUNDWATER SAMPLES
LL&S LANDFILL
SALEM, NEW HAMPSHIRE**

SAMPLE NUMBER				D34002	D34003	D34004	D34005	D34006	D34000	D34010
LOCATION				GW-MW-2	GW-MW-3	GW-MW-5	GW-MW-6	GW-MW-7	GW-MW-1-93	GW-MW-1-930
LABORATORY NUMBER				CIX764	CIX765	CIX766	CIX767	CIX768	CIX762	CIX772
WELL TYPE				Overburden	Overburden	Overburden	Overburden	Overburden	Overburden	Overburden
COMPOUND	MDL	RDL	AGQS**							
Perfluorobutane Sulfonate (PFBS)	0.27	2.0	-----	0.27 U	9.2	21	20	23	13	13
Perfluorobutanoic Acid (PFBA)	0.41	2.0	-----	0.51 J	48	75	130*	58	7.4	7.9
Perfluoroheptanoic Acid (PFHpA)	0.39	2.0	-----	0.7 J	48	70	68	110*	12	15
Perfluorohexane Sulfonate (PFHxS)	0.40	2.0	-----	1.4 J	61	55	73	130*	24	26
Perfluorohexanoic Acid (PFHxA)	0.42	2.0	-----	0.94 J	50	93	93	82	18	18
Perfluoro-n-Octanoic Acid (PFOA)	0.39	2.0	70.0	2.5	220*	120*	210*	560*	40	44
Perfluorononanoic Acid (PFNA)	0.33	2.0	-----	0.33 U	7.9	17	17	17	4.4	4.9
Perfluorooctane Sulfonate (PFOS)	0.30	2.0	70.0	1.3 J	92	110*	220*	260*	58	61
Perfluoropentanoic Acid (PFPeA)	0.46	2.0	-----	0.79 J	58	120*	93*	120*	25	27
DILUTION FACTOR				1.00	1.0 and 10*	1.0 and 10*	1.0 and 10*	1.0 and 10*	1.00	1.00
DATE SAMPLED				5/11/2016	5/11/2016	5/11/2016	5/11/2016	5/11/2016	5/11/2016	5/11/2016
DATE EXTRACTED				5/25/16	5/25/16	5/25/16	5/25/16	5/25/16	5/25/16	5/25/16
DATE ANALYZED				5/26/16	5/26/16	5/26/16	5/26/16	5/26/16	5/26/16	5/26/16

NOTES:

- 1) Samples collected by Weston Solutions, Inc., Superfund Technical Assessment and Response Team (START) on 11 May 2016.
- 2) Samples analyzed by Maxxam Analytics International Corporation, Mississauga, Ontario, Canada, using modified EPA Method 537, Determination Of Selected Perfluorinated Alkyl Acids In Drinking Water By Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS).
- 3) Results are reported in nanograms per Liter (ng/L). Equivalent to parts per trillion (ppt).
- 4) U = Values not detected above the Method Detection Limit (MDL).
- 5) J = Estimated concentration between the MDL and Reportable Detection Limit (RDL).
- 6) Sample GW-MW-1-930 is a field duplicate of GW-MW-1-93.
- 7) ** Ambient Groundwater Quality Standards (AGQS), in ng/L, established by the New Hampshire Department of Environmental Services (NHDES) per emergency rule established on 31 May 2016.
- 8) ----- AGQS not established.
- 9) Values bolded and shaded in yellow exceed the NHDES AGQS for PFOA or PFOS.
- 10) Values bolded and shaded in blue exceed the NHDES AGQS when concentrations of PFOA and PFOS are combined.
- 11) Value bolded and shaded in orange indicates that although PFOA in the sample exceeds the NHDES AGQS, PFOS concentrations only exceed the NHDES AGQS when combined with PFOA.
- 12) RB-01 is the field rinsate blank.
- 13) TB-01 is the laboratory trip blank.
- 14) FTB-01 is the field trip blank.
- 15) * Due to high concentration of target analyte, sample required 10x dilution. Detection limit was adjusted accordingly.

TABLE 1

**SUMMARY OF
PERFLUORINATED COMPOUNDS
ANALYSIS IN GROUNDWATER SAMPLES
LL&S LANDFILL
SALEM, NEW HAMPSHIRE**

SAMPLE NUMBER				D34001	D34007	D34008	D34009	D34011	D34013	D34012
LOCATION				GW-MW-2-93	GW-WRB#208.1035	GW-WRB#208.1130	GW-WRB#208.1329	RB-01	TB-01	FTB-01
LABORATORY NUMBER				CIX763	CIX769	CIX770	CIX771	CIX773	CIX775	CIX774
WELL TYPE				Overburden	Bedrock Supply	Bedrock Supply	Bedrock Supply			
COMPOUND	MDL	RDL	AGQS**							
Perfluorobutane Sulfonate (PFBS)	0.27	2.0	-----	8.2	9.5	6.9	8.4	0.27 U	0.27 U	0.27 U
Perfluorobutanoic Acid (PFBA)	0.41	2.0	-----	22	28	16	24	0.41 U	0.41 U	0.41 U
Perfluoroheptanoic Acid (PFHpA)	0.39	2.0	-----	19	18	18	19	0.39 U	0.39 U	0.39 U
Perfluorohexane Sulfonate (PFHxS)	0.40	2.0	-----	73	53	62	60	0.40 U	0.40 U	0.40 U
Perfluorohexanoic Acid (PFHxA)	0.42	2.0	-----	32	23	24	19	0.42 U	0.42 U	0.42 U
Perfluoro-n-Octanoic Acid (PFOA)	0.39	2.0	70.0	62	75	72	69	0.39 U	0.39 U	0.39 U
Perfluorononanoic Acid (PFNA)	0.33	2.0	-----	5.5	4.7	4.7	4.0	0.33 U	0.33 U	0.33 U
Perfluorooctane Sulfonate (PFOS)	0.30	2.0	70.0	26	59	73	58	0.30 U	0.30 U	0.30 U
Perfluoropentanoic Acid (PFPeA)	0.46	2.0	-----	48	27	28	23	0.46 U	0.46 U	0.46 U
DILUTION FACTOR				1.00	1.00	1.00	1.00	1.0	1.0	1.0
DATE SAMPLED				5/11/2016	5/11/2016	5/11/2016	5/11/2016	5/11/2016	3/8/2016	5/11/2016
DATE EXTRACTED				5/25/16	5/25/16	5/25/16	5/25/16	5/25/16	5/25/16	5/25/16
DATE ANALYZED				5/26/16	5/26/16	5/26/16	5/26/16	5/26/16	5/26/16	5/26/16

NOTES:

- 1) Samples collected by Weston Solutions, Inc., Superfund Technical Assessment and Response Team (START) on 11 May 2016.
- 2) Samples analyzed by Maxxam Analytics International Corporation, Mississauga, Ontario, Canada, using modified EPA Method 537, Determination Of Selected Perfluorinated Alkyl Acids In Drinking Water By Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS).
- 3) Results are reported in nanograms per Liter (ng/L). Equivalent to parts per trillion (ppt).
- 4) U = Values not detected above the Method Detection Limit (MDL).
- 5) J = Estimated concentration between the MDL and Reportable Detection Limit (RDL).
- 6) Sample GW-MW-1-930 is a field duplicate of GW-MW-1-93.
- 7) ** Ambient Groundwater Quality Standards (AGQS), in ng/L, established by the New Hampshire Department of Environmental Services (NHDES) per emergency rule established on 31 May 2016.
- 8) ----- AGQS not established.
- 9) Values bolded and shaded in yellow exceed the NHDES AGQS for PFOA or PFOS.
- 10) Values bolded and shaded in blue exceed the NHDES AGQS when concentrations of PFOA and PFOS are combined.
- 11) Value bolded and shaded in orange indicates that although PFOA in the sample exceeds the NHDES AGQS, PFOS concentrations only exceed the NHDES AGQS when combined with PFOA.
- 12) RB-01 is the field rinsate blank.
- 13) TB-01 is the laboratory trip blank.
- 14) FTB-01 is the field trip blank.
- 15) * Due to high concentration of target analyte, sample required 10x dilution. Detection limit was adjusted accordingly.

Attachment C

Photo-documentation Log

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PHOTOGRAPHY LOG SHEET
LL & S Landfill • Salem, New Hampshire



SCENE: View of construction and demolition debris at the LL & S Landfill site. Photograph taken facing northeast.

DATE: 11 May 2016

PHOTOGRAPHY BY: Andrew Danikas

TIME: 1054 hours

CAMERA: iPhone 6



SCENE: View of monitoring well MW-3 located along the southern perimeter of the LL & S Landfill. Photograph taken facing north.

DATE: 11 May 2016

PHOTOGRAPHY BY: George Mavris

TIME: 0907 hours

CAMERA: iPhone 6

PHOTOGRAPHY LOG SHEET
LL & S Landfill • Salem, New Hampshire



SCENE: View of monitoring well MW-3 and dedicated sampling tubing in well, located along the southern perimeter of the LL & S Landfill.

DATE: 11 May 2016

PHOTOGRAPHY BY: George Mavris

TIME: 1332 hours

CAMERA: iPhone 6



SCENE: View of dedicated sampling tubing removed from monitoring well MW-3 prior to purging and sampling.

DATE: 11 May 2016

PHOTOGRAPHY BY: George Mavris

TIME: 1242 hours

CAMERA: iPhone 6

PHOTOGRAPHY LOG SHEET
LL & S Landfill • Salem, New Hampshire



SCENE: View of low-flow groundwater sampling set-up at monitoring well MW-3 located along the southern perimeter of the LL & S Landfill. Photograph taken facing east.

DATE: 11 May 2016

TIME: 1243 hours

PHOTOGRAPHY BY: George Mavris

CAMERA: iPhone 6



SCENE: View of monitoring well MW-5 located along the eastern perimeter of the LL & S Landfill. Photograph taken facing northeast.

DATE: 11 May 2016

TIME: 0948 hours

PHOTOGRAPHY BY: Andrew Danikas

CAMERA: iPhone 6

PHOTOGRAPHY LOG SHEET
LL & S Landfill • Salem, New Hampshire



SCENE: View of door leading into building where bedrock supply well WRB#208.1035 is located.
Photograph taken facing south.

DATE: 11 May 2016

PHOTOGRAPHY BY: Bill Mahany

TIME: 1146 hours

CAMERA: iPhone 6



SCENE: View of sampling port for bedrock supply well WRB#208.1035.

DATE: 11 May 2016

PHOTOGRAPHY BY: Bill Mahany

TIME: 0907 hours

CAMERA: iPhone 6

PHOTOGRAPHY LOG SHEET
LL & S Landfill • Salem, New Hampshire



SCENE: View of bedrock supply well WRB#208.1130 and pressure tank located along the northeastern perimeter of the LL & S Landfill. Photograph take facing southwest.

DATE: 11 May 2016

PHOTOGRAPHY BY: Bill Mahany

TIME: 0948 hours

CAMERA: iPhone 6



SCENE: View of sampling port for bedrock supply well WRB#208.1130 located along the northeastern perimeter of the LL & S Landfill. Photograph take facing southwest.

DATE: 11 May 2016

PHOTOGRAPHY BY: Bill Mahany

TIME: 0948 hours

CAMERA: iPhone 6

PHOTOGRAPHY LOG SHEET
LL & S Landfill • Salem, New Hampshire



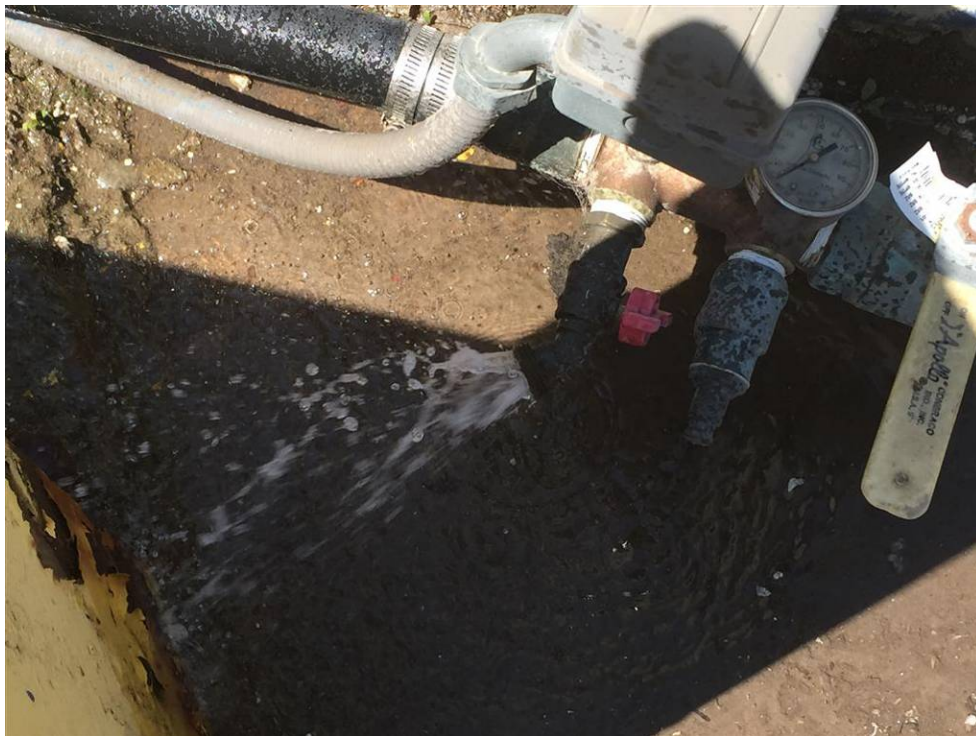
SCENE: View of bedrock supply well WRB#208.1329 and pressure tank located along the northeastern perimeter of the LL & S Landfill. Photograph take facing southwest.

DATE: 11 May 2016

PHOTOGRAPHY BY: Bill Mahany

TIME: 0948 hours

CAMERA: iPhone 6



SCENE: View of sampling port for bedrock supply well WRB#208.1329 located along the northeastern perimeter of the LL & S Landfill. Photograph take facing southwest.

DATE: 11 May 2016

PHOTOGRAPHY BY: Bill Mahany

TIME: 0948 hours

CAMERA: iPhone 6

Attachment D

Chain-of-Custody Records

USEPA

Case #: 0884F

CarrierName: FedEx

AirbillNo: 776322853002

CHAIN OF CUSTODY RECORD

Site #: R01-160511MB

Contact Name: John Burton

Contact Phone: 978-621-1214

No: 01ZZ-03079-001

Lab: Maxxam Analytics

Lab Contact: Melissa DiGrazia

Lab Phone: 905-817-5784

Lab #	Sample #	Location	Analyses	Matrix	Collected	Sample Time	Numb Cont	Container	Preservative	Lab QC
	D34000	GW-MW-1-93	PFC - EPA m537	Ground Water	2016-05-11	13:15	2	250 mL HDPE Bottle	Trizma	
	D34001	GW-MW-2-93 (MS/MSD)	PFC - EPA m537	Ground Water	2016-05-11	11:35	6	250 mL HDPE Bottle	Trizma	Y
	D34002	GW-MW-2	PFC - EPA m537	Ground Water	2016-05-11	16:05	2	250 mL HDPE Bottle	Trizma	
	D34003	GW-MW-3	PFC - EPA m537	Ground Water	2016-05-11	13:20	2	250 mL HDPE Bottle	Trizma	
	D34004	GW-MW-5	PFC - EPA m537	Ground Water	2016-05-11	14:10	2	250 mL HDPE Bottle	Trizma	
	D34005	GW-MW-6	PFC - EPA m537	Ground Water	2016-05-11	15:35	2	250 mL HDPE Bottle	Trizma	
	D34006	GW-MW-7	PFC - EPA m537	Ground Water	2016-05-11	16:45	2	250 mL HDPE Bottle	Trizma	
	D34007	GW-WRB#208.1035	PFC - EPA m537	Ground Water	2016-05-11	11:05	2	250 mL HDPE Bottle	Trizma	
	D34008	GW-WRB#208.1130	PFC - EPA m537	Ground Water	2016-05-11	10:15	2	250 mL HDPE Bottle	Trizma	
	D34009	GW-WRB#208.1329	PFC - EPA m537	Ground Water	2016-05-11	11:40	2	250 mL HDPE Bottle	Trizma	
	D34010	GW-MW-1-930	PFC - EPA m537	Ground Water	2016-05-11	13:15	2	250 mL HDPE Bottle	Trizma	
	D34011	RB-01	PFC - EPA m537	Blank	2016-05-11	16:30	2	250 mL HDPE Bottle	Trizma	
	D34012	FTB-01	PFC - EPA m537	Blank	2016-05-11	16:30	1	250 mL HDPE Bottle	Trizma	
	D34013	TB-01 (TBLK-EPEU-16-3226)	PFC - EPA m537	Blank	2016-03-08		1	250 mL HDPE Bottle	Trizma	
	D34014	SRS2492	PFOA/PFOS	Performance Eval	2016-05-11	07:00	1	Vial		

Special Instructions: Please contact John Burton - John.Burton@westonsolutions.com, 1-978-552-2130 with 14 day verbal results.

Reporting limit:

PFBS = 0.005 ug/L, PFHpA = 0.005 ug/L, PFHxS = 0.005 ug/L

PFOA = 0.005 ug/L, PFNA = 0.005 ug/L, PFOS = 0.005 ug/L

PFBA = 0.005 ug/L, PFPeA = 0.005 ug/L, PFxA = 0.005 ug/L

SAMPLES TRANSFERRED FROM**CHAIN OF CUSTODY #**

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt